

USSR.

✓ Temperature of vitrification and fluidity of natural rubbers of different molecular weights. A. Tager, M. Loyeva, T. Kantor, and L. Muzheva. *Zhur. Priklad. Khim.* 27, 1227-30(1954).—The mol. wt. of natural rubbers milled for different periods was detd. from the reduced viscosity-concn. plots by the relation $[\eta] = KM^a$, where $[\eta]$ is the intrinsic viscosity, K and a are const., and M is the mol. wt. From the degree of deformation as a function of the temp. detd. by the method of Kargin, *et al.* (*C.A.* 43, 7294f), it was shown that the mol. wt. affected the temp. of the initial fluidity but not that of vitrification. I. Benecowitz

62

7001 R. D. 11

Chemistry - Elastomers

FD-2525

Pub. 50 - 4/14

Authors : Tager, A. A.; Card Chem Sci; Gordeyeva, T. B.; Karlinskaya, D. Yu.; Kurochkina, L. M.

Title : Methods of evaluating some technological properties of sodium butadiene rubbers

Journal : Khim. prom. No 4, 209-213, Jun 1955

Abstract : Describe the method of "foaming" and the method of thermomechanical curves, which can be used in evaluating the capacity of rubbers to form a tridimensional structural network. Ten references, all of them USSR, 8 since 1940. Three graphs, 2 tables.

Locations : Ural State University; Sverdlovsk Ebonite Products Plant

Thermodynamic study of copolymer solutions. I
 Thermodynamic study of solutions of ~~butadiene-styrene~~ ^{CH}
 copolymers. A. A. Tager, L. K. Kosova, D. Yu.
 Karlinskaya, and ~~A. M. Gor'kii~~ (A. M. Gor'kii Ural State
 Univ., Sverdlovsk). *Kolloid. Zhur.* 17, 315-23 (1955); cf.
 C.A. 47, 4096c. — The integral heats Q of soln. of copolymers
 in C_6H_6 were equal to those of swelling, i.e. the heats of diln.
 were very small. The Q was immeasurably small for co-
 polymers contg. 60 or 70 wt. % styrene; it was pos. when
 the fraction x of styrene was greater and increased with x ,
 and was more neg. the smaller was x between $x = 10$ and 50%;
 e.g. at $x = 10\%$, $Q = -1.18$ cal. for 1 g. copolymer. Sorp-
 tion a of C_6H_6 vapor by copolymers, up to the relative vapor
 pressure p/p_0 of 0.5, was greater the smaller was x ; at higher
 p/p_0 some curves of a vs. p/p_0 crossed. Computation of
 these data showed that penetration of C_6H_6 into copolymers
 with $x < 90\%$ was assocd. with an increase in entropy S
 (because of the flexibility of the polymer chains) while S
 of the rigid copolymer with $x = 90\%$ decreased, and that
 copolymers with a small x dissolved in C_6H_6 as a result of
 diffusion while those with a large x dissolved because of an
 interaction between copolymer chains and C_6H_6 .

I. I. Bikerman

③

lager, H.H.

CH ✓ Thermodynamic study of copolymer solutions. II. Thermodynamic study of solutions of copolymers of butadiene and acrylonitrile. A. A. Tager and L. K. Kosova (A. M. Gorkii Ural State Univ., Sverdlovsk). *Kolloid Zhur.* 17, 391-6 (1955); cf. *C.A.* 49, 15428s. Copolymers contg. 18 (I), 26 (II), and 40 wt. % (III) acrylonitrile, and polyacrylonitrile (IV) were studied. The heat of soln. (or swelling) in C_6H_6 was zero for I and IV, 0.45 for II, and 0.70 cal./g. polymer for III. The sorption of C_6H_6 vapor increased in the series $IV < III < I < II$; e.g. at relative vapor pressure of 0.5, 1 g. of II took up 0.3 g. C_6H_6 . From these data the enthalpy, free energy, and entropy of the systems were calcd. As penetration of C_6H_6 into the polymers was assocd. with an entropy increase, the polymer chains must be flexible. The affinity of C_6H_6 for the polymers was detd. by this flexibility and the ratio of the polarities of polymer and solvent. The temp. below which the "glassy state" appeared was -45 to -55° for I, -30 to -45° for II, and -20 to -27° for III. The heat of soln. of IV in $HCONMe_2$ was 5.2 cal./g. polymer.
J. J. Bikerman

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MA 8/5

①

Tager, A.A.

✓ Effect of chemical structure of butadiene-styrene copolymers on their transformation temperatures. A. A. Tager and L. A. Yurina (Zh. prikl. Khim., 1955, 28, 1327—1331). The vitrification temp. of styrene-butadiene copolymers falls regularly with rising butadiene content, from 10 to 90%, and of polyacrylic esters $[-CH_2-CH(CO_2R)-]_n$ with increase in mol. wt. of R. The temp. at which fluid flow begins falls steadily as the styrene content rises from 10 to 60%, changing little thereafter; that for $[-CH_2-CH(CO_2R)-]_n$ varies in the order $R = Me \gg Et > Bu$.

R. TRUSCOE

M. A. YOUTZ
2 copies

Chem 2
Metals
DM

Tager, A.A.

The effect of the molecular weight of polystyrene on the packing density of the molecular chain. T. V. Garovskaya, V. A. Kargin, and A. A. Tager (D. Vo. Karpov, Phys. Chem. Inst., Moscow). *Dokl. Akad. Nauk SSSR*, 1968, 183, 8 (1968).—The sorption isotherm of ethylbenzene by polystyrene samples over a wide variety of mol. wts., and the differential heat of mixing of these samples, were used in the calculation of the partial specific entropy changes caused by mixing. The entropy changes $\Delta S_p = f(w_2)$ (w_2 is the polymer proportion) form curves having min., the values of which are less, the smaller is the mol. wt. The value of that min. combined with the effect and the sorption data, can be used to evaluate the packing d. of rigid chain mols.

W. M. Sterberg

PM

LFT

TAGER, A. A.

USSR/ Chemistry - Physical chemistry

Card 1/1 Pub. 22 - 35/60

Authors : Tager, A. A.; Krivokorytova, R. V.; and Khodorov, P. M.

Title : Heats of solution of polystyrenes of different molecular weight and the packing density of stable chains

Periodical : Dok. AN SSSR 100/4, 741-743, Feb 1, 1955

Abstract : The integral heats of solution were determined for various fractions in benzene and for a hydrogenated polystyrene monomer - ethyl benzene. The results indicate that polystyrene with a molecular weight of about 1000 dissolves in benzene and in ethyl benzene with a zero thermal effect. It was observed that the low-molecular polystyrene dissolves in a natural hydrogenated monomer - ethyl benzene - with a zero thermal effect which indicates that the packing density of the low-molecular polystyrene is close to the packing density of ethyl benzene molecules. An increase in molecular weight was observed to be followed by a considerable increase in the heat of solution. Four references: 3 USSR and 1 USA (1950-1954). Table; graph.

Institution : The A. M. Gorkiy Ural State University

Presented by: Academician V. A. Kargin, August 17, 1954

Name: TAGER, Anna Aleksandrovna

Dissertation: Thermodynamic study of solutions of
amorphous high-molecular compounds
and structure of polymers

Degree: Doc Chem Sci

Affiliation: Ural State U imeni Gor'kiy

Defense Date, Place: 24 Dec 56, Council of Sci Res Phys-
Chem Inst imeni Karpev

Certification Date: 21 Sep 57

Source: EMVD 22/57

AUTHORS: ~~Tager, A. A.~~, Smirnova, A.,
Sysuyeva, N.

SOV/156-98-1-33/40

TITLE: The Density of Packing of Polymers and the Volume Change
Connected With Their Dissolution (Plotnost' upakovki polimerov
i izmeneniye ob'yema pri ikh rastvorenii)

PERIODICAL: Nauchnyye doklady vysshey shkoly, Khimiya i khimicheskaya
tekhnologiya, 1958, Nr 1, pp. 135 - 138 (USSR)

ABSTRACT: The results obtained from the investigations of different
properties of polymeric substances prove that - according to
the chemical structure and the physical state - the polymers
may have both a dense and a loose packing. It may be expected
that the difference in the density of packing will act on the
change of its volume connected with dissolution. In a general
case the change of volume connected with the mixing of two
components may be attributed to 3 causes: 1) to the difference
of the energies of interaction in an isolated state and in
the mixture, 2) to the difference between the molecular size
of the components and 3) to the difference in the densities of
packing of the molecules. In order to eliminate the first
factor, it is advisable to investigate the change of volume

Card 1/4

The Density of Packing of Polymers and the Volume
Change Connected With Their Dissolution

SCN/156-55-1-33/46

taking place with the mixing of components which have a similar chemical structure. If the liquids are related also with respect to the factors 2) and 3), no change of volume must take place at mixing. The authors selected 2 polymers which are different both with respect to their chemical structure and to their physical state: poly-isobutylene and polystyrene. In order to eliminate the influence exercised by the chemical structure of the solvent, such solvents were selected which are closely related to the polymer: ethyl-benzene for polystyrene and n-heptane for poly-isobutylene. The results obtained are shown in figure 1. It hence results that in the polystyrene-ethyl-benzene system a greater compression is observed than in the poly-isobutylene-isooctane system. It results from figure 2 that a considerable compression takes place in the polystyrene-benzene- and polystyrene-toluene systems. An analogous picture is found in the polystyrene-cyclo-hexanon system. In connection with this, the compression in the poly-isobutylene-benzene and poly-isobutylene-toluene systems is as small as in the poly-isobutylene-n-heptane systems (Fig 3). These data show clearly that in connection

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The Density of Packing of Polymers and the Volume
Change Connected With Their Dissolution

SOV, 156-52-1-33/46

with the dissolution of a loosely packed polymer a greater compression takes place than with the dissolution of a densely packed polymer. Figure 4 shows data for a series of co-polymers of butadiene and styrene. Benzene was used as solvent. In connection with the dissolution of a co-polymer with 80% styrene-members a strong compression takes place which indicates a loose packing of this polymer. The compression decreases as the increasing number of the butadiene-members in the macromolecule. This signifies that the density of co-polymers increases as the decrease of the phenyl substituents. There are 4 figures and 3 references, 2 of which are Soviet.

ASSOCIATION: Kafedra fizicheskoy khimii Ural'skogo gosudarstvennogo universiteta im. A.M. Gor'kogo (Chair of Physical Chemistry at the Ural State University imeni A.M. Gor'kiy)

SUBMITTED: October 16, 1957

Card 3/4

The Density of Packing of Polymers and the Volume
C. are Connected With Their Dissolution

SOV/156-98-1-33/1

Card 4/4

AUTHORS: Tager, A. A., Galkina, L. A. SOV/156-58-2-39/48

TITLE: The Thermodynamic Investigation of the Solution Process of Polystyrene in Methyl-Ethyl Ketone and Ethylacetate (Termo-dinamicheskoye issledovaniye protsessa rastvoreniya polistirola v metiletilketone i etilatsetate)

PERIODICAL: Nauchnyye doklady vysshey shkoly. Khimiya i khimicheskaya tekhnologiya, 1958, Nr 2, pp. 357 - 360 (USSR)

ABSTRACT: The experimental results concerning the solution of polystyrene in benzene (Ref 1) and ethyl-benzene (Ref 2) give evidence of laws which differ basically from those concerning the elastic polymers. The most important difference is the modification of the entropy of the solvent. The penetration of the benzene- or ethyl-benzene molecules into the range of the polystyrene macromolecule is accompanied by an abrupt decrease of the entropy. In contrast to this the increase of the solvent entropy is characteristic of the dissolution of the elastic polymers which are in an elastic state (the mixture entropy is high). An attempt to explain the causes to which this law is due was interesting: it is either the nature of the polymer or that of the solvent.

Card 1/3

The Thermodynamic Investigation of the Solution

SOV/156-58-2-39/46

Process of Polystyrene in Methyl-Ethyl Ketone and Ethylacetate

Therefore the investigation mentioned in the title was carried out. The two mentioned liquids dissolve polystyrene (molecular weight 142000) to a different extent: it is well soluble in methyl-ethyl ketone, whereas ethyl-acetate causes only a swelling of polystyrene. Sorption isothermal lines (fig 1) of both liquids by polystyrene were determined by means of earlier described methods (Ref 1) and the heat of solvation was determined. Figure 1 shows that methyl-ethyl-ketone is sorbed by polystyrene in greater quantities than ethyl-acetate. On the strength of these results the authors draw the following conclusions: the character of the observed laws does not depend on the nature of the low-molecular liquid. They are determined only by the nature of the polystyrene. An abrupt decrease of the entropy of the low-molecular liquid which takes place in the case of penetration of the latter into the polystyrene phase may be explained by a loose packing of the polystyrene macromolecules and by the formation of orientated adsorption layers of the low-molecular liquid in the micropores of this polymeric sorbent.

Card 2/3

The Thermodynamic Investigation of the Solution
Process of Polystyrene in Methyl-Ethyl Ketone and Ethylacetate

SOV/156-58-2-39/48

There are 4 figures and 5 references, 4 of which are Soviet.

ASSOCIATION: Kafedra fizicheskoy khimii Ural'skogo gosudarstvennogo uni-
versiteta im.A.M.Gor'kogo (Chair of Physical Chemistry
of the Ural State University imeni A.M.Gor'kiy)

SUBMITTED: November 27, 1957

Card 3/3

AUTHOR: Tager, A.A. (Sverdlovsk) 74-27-4-5/6

TITLE: On a "Good" and a "Bad" Solvent of Polymers (O "khorosham" i "plokhom" rastvoritele polimerov)

PERIODICAL: Uspekhi Khimii, 1958, Vol. 27, Nr 4, pp. 481-487 (USSR)

ABSTRACT: In publications dealing with this subject the expressions "good" and "bad" are frequently found in connection with solvents used for polymers. Also on the IX Conference for the Investigation of Compounds of High Molecular Weight there was much that needed explaining in this respect. The present paper subjects this problem to a thorough investigation. As, by the addition of a precipitating agent, the solubility of the medium can be reduced, generalizing conclusions were drawn from this fact: A solvent is described as "bad" if the viscosity of the solution is inferior to that of a "good" solvent. This gives rise to the question as to what, with respect to energetics, may be looked upon more or less as a good solvent. In the present paper the works by Frith and Spurlin (Refs 6,7), Pakshver, Kakhomskaya and Dolinin (Ref 9) and Sherman, Kozlov (Ref 10) are discussed for the purpose of finding an answer to this question. In the works mentioned it is

Card 1/2

On a "Good" and a "Bad" Solvent of Polymers

74-27-4-5/8

proved that if methanol and butanol are added, viscosity is very slightly reduced in the methylene chloride. Great interest was caused by the works by Kargin, Mirline and Bakeyev (Ref 19) which deal with structural formation in dependence on the shape of the chains in polyelectrolyte solutions. In this connection the author is of the opinion that a final and definite explanation depends in a high degree on what is required in practice (with respect to solvents). In any case it can be said that a good solvent for any kind of polymer is one in the case of which the polymer forms a thermodynamic system. With decreasing solubility the absolute value $\Delta \mu_1$ is reduced and in connection herewith also the clearness and transparency of the solution. As regards the viscosity of the solution it was shown that this problem is connected with the elasticity of the chains. In the solutions of elastic polymers viscosity in a good solvent is greater than in a bad one. In the solutions of rigid polymers viscosity, in the case of a good solvent, can be greater and weaker than in a bad one. In the case of polymers with stepped degrees of elasticity of the chains there may be no correlation between elasticity and solubility of the solvent. There are 19 references, 11 of which are Soviet.

1. Organic solvents--Chemical properties

Card 2/2

AUTHORS: Tager, A. A., Kargin, V. A.

76-32-6-26/46

TITLE: Thermodynamic Investigation of the System Polymer-Hydrated Monomer (Termodinamicheskoye issledovaniye sistemy polimer-gidrirovanny monomer)II. The Solution Heat of Copolymers in the Mixture of Hydrated Monomers (II. Teploty rastvoreniya sopolimerov v smesi gidrirovannykh monomerov)

PERIODICAL: Zhurnal fizicheskoy khimii, 1958, Vol. 32, Nr 6, pp. 1362 - 1366 (USSR)

ABSTRACT: The present paper investigates copolymers of butadiene and styrene as well as saponified polyvinylacetates at different degrees of saponification. M.Iovleva and Yu.Treskunova took part in the experimental part of the work. The types of butadiene- and styrene copolymers (their brand names being mentioned) to be investigated were supplied by the All Union Scientific Research Institute for Synthetic Rubbers. The polyvinylacetate was correspondingly saponified. A mixture of ethylbenzene and isooctane at a ratio corresponding to the composition of the copolymer was used as calorimetric liquid. From the experimental results shown in tables it may be seen that a higher content of butadiene (the types CKC 10, CKC 30) causes a heat absorption in the

Card 1/3

Thermodynamic Investigation of the System Polymer- 000 76-32-6-26/46
 -Hydrated Monomer. II. The Solution Heat of Copolymers in the Mixture of
 Hydrated Monomers

solution of the mixture of the corresponding hydrated monomers, while the increase of the amount of phenyl substituents shows a higher value of the solution heat. In classifying the obtained results the authors mention that an increase of the number of substituents causes a loosening of the molecular packing while in the presence of polar OH-groups no such loosening is noticed. The use of hydrogen bindings in polyvinyl alcohol was proved by S.N.Zhurkov and B.Ya.Levin (Ref 6), however, the heat absorption in the system polyvinyl alcohol-ethanol can not be fully explained, as there are two possibilities for it. Among other facts the investigations showed that at the transition from the polymer with mobile chains to one with fixed chains a continuous change of all thermodynamic properties of the solutions takes place. An additivity of the change of the mobility and density of the packing was found only within the range of from 20 to 70% butadiene, as, e.g. the introduction of 10% butadiene into the polystyrene chain changes these properties to a great extent; this agrees to the data obtained by A.I. Marey and M.Z.Al'tshuller (Ref 8). There are 2 figures, 3 tables,

Card 2/3

Thermodynamic Investigation of the System Polymer-
-Hydrated Monomer. II. The Solution Heat of Copolymers in the Mixture of
Hydrated Monomers

76-32-6-26/46

and 8 references, which are Soviet.

ASSOCIATION: Vsesoyuznyy institut sinteticheskogo kauchuka, Ural'skiy gosudarstvennyy universitet im. A.M. Gor'kogo, Sverdlovsk (Sverdlovsk, All-Union Institute of Synthetic Rubber, Ural State University imeni A.M. Gor'kiy)

SUBMITTED: February 18, 1957

1. Polymers--Heat of solution

Card 3/3

SOV/46-32-9-8/57

AUTHOR: Tager, A. A., Iovleva, M.

TITLE: Thermodynamic Investigations of Copolymer Solutions
(Termodinamicheskiye issledovaniya rastvorov sopolimerov
III. Saponified Polyvinyl Acetates (III. Omylenyye
polivinil'acetat))

PERIODICAL: Zhurnal Fizicheskoy Khimii, 1958, Vol. 32, Nr 8.
pp. 1771-1778 (USSR)

ABSTRACT: In investigating the copolymer solutions containing groups
of a different degree of polarity in their chains the above
mentioned compounds were selected. They will not be obtained
by copolymerization, they may, however, to a certain extent
be regarded as copolymers of vinyl alcohol and vinyl acetate.
The saponification was carried out according to instructions
by Professor J. E. Cotton. The calculation of the molecular
weight of the saponification products according to Gerbil'skiy
(1951) yields the value 114 000, and according to another
equation 141 000. It was observed that the products with a
higher acetyl number are well soluble in acetone, while those
of a lower (9%) number are not soluble and also do not swell.

Card 1/2

Thermodynamic investigations of copolymer
solutions. II. Saponified Polyvinyl Acetates

307/76-32-8-8/37

The heat of the interaction of the saponification products with acetone decreases according to the increase of the number of hydroxyl groups. Determinations of the sorption isotherms were carried out and are represented graphically. From the experimental results obtained may be seen that polyvinyl acetate has elastic chains and a dense packing. The elasticity of the chain decreases and the density of the packing increases at an increase in the number of the OH groups. The experimental results may explain the data by V.S. Karginov, V.A. Kargin and A.I. Kizaygorodskiy (Ref 10); they agree with those by V.A. Kargin and I.Ya. Petrov (Ref 12) as well as by Kistler and others (Ref 13). The figures, tables and references, all of which

Card 2/2

SUBMITTED :

Academy of Sciences of the USSR, Institute of Chemistry, A.M. Gor'kogo
Moscow State University named A.M. Gor'kiy,

February 18, 1957

AUTHOR: Tserer, A. A., Gariyanova, N. N.

SDN/76-32-9-4/46

TITLE: The Temperature Dependence of the Heat of Solution and the Packing of Polymer Molecules in Various Physical States
(Temploty rastvoreniya i upakovka molekul polimerov v raznykh fizicheskikh sostoyaniyakh)

PERIODICAL: Zhurnal fizicheskoy khimii, 1958, Vol 32, Nr 9,
pp 1958 - 1962 (USSR)

ABSTRACT: The authors studied the total heat of solution of polystyrene with a molecular weight of 327,000. The solvents used were ethyl benzene and toluene. The determinations were carried out using a calorimeter and at temperatures between -13° and $+113^{\circ}$. The heat of solution decreases with increasing temperature and becomes zero at 70° (Fig 1). The value of $T\Delta\bar{S}_1$ for the system polystyrene-toluene at 70° was calculated; in figure 2 the curve for this system is compared to the curve for the polystyrene-benzene system at 25° (Ref 3). The curve at 70° corresponds to the curve for flexible polymers. With a temperature increase the relaxation time decreases, the flexibility of the polystyrene chains improves, and consequently the packing of the

Card 1/2

The Temperature Dependence of the Heat of Solution and the Packing of Polymer Molecules in Various Physical States

SOV/76-32-9-4/46

chains becomes closer. There are 2 figures and 16 references, 12 of which are Soviet.

ASSOCIATION: Ural'skiy gosudarstvennyy universitet, Sverdlovsk (Sverdlovsk, Ural State University)

SUBMITTED: February 18, 1957

Card 2/2

3(4)

AUTHORS:

Tal'er, A. M., Karain, V. A.

SOV/76-32-12-7/32

TITLE:

The Solution Heat of Polymers and Their Hydrogenated Monomers in the Same Liquid (Teplota rastvoreniya polimerov i ikh gidrovannykh monomerov v odnoy i toy zhe zhidkosti)

PERIODICAL:

Zhurnal fizicheskoy khimii, 1958, Vol 32, Nr 12, pp 2694 - 2701 (USSR)

ABSTRACT:

Four cases are to be distinguished: 1) both the hydrated monomer and the polymer are amorphous; 2) the monomer is crystalline, the polymer amorphous; 3) the monomer is amorphous, the polymer crystalline; 4) both are crystalline. The present paper investigates only cases 1 and 2. Case 1: Test results show that the two solution heats are never equal. Two types of bindings are represented in the polymer: a) a large number of molecules is chemically combined in a polymer chain, b) between the chain there are much weaker intermolecular forces. Whereas in the hydrogenated monomer all molecules separate and mix with the molecules of the solvent, the polymeric chains remain combined and only the intermolecular forces must be overcome by the solution. Thus, the

Card 1/3

The Solution Heat of Polymers and Their Hydrogenated Monomers in the Same Liquid

SOV/76-32-12-7/32

energy demand for the dissolution of polymers ought to be less than in the case of monomers. In this case, however, a correction is necessary because of the packing density of the polymer. If the polymer packing is as dense as that of the monomer. In this case the above mentioned divergency was measured ($E_{\text{polym}} < E_{\text{monom}}$). B. The polymer packing is looser than that of the monomer. In this case less energy is required for the dissolution of the polymer and the divergency becomes even greater ($E_{\text{polym}} \ll E_{\text{monom}}$). - C. The polymer packing is denser than that of the monomer. In this case the intermolecular forces of the polymer can become so strong that more energy is required to dissolve the polymer than the monomer ($E_{\text{polym}} > E_{\text{monom}}$). Case 2: The same considerations apply. The polymer chains do not dissolve but the molecules of the monomer have yet to be extracted from their crystal lattice. Thus: $E_{\text{polym. lat. h.}} \ll E_{\text{monom. crystall.}}$. Also the effect of the crystal structure is shown, for example, by the energy difference in the dissolution of

Card 2/3

The Solution Heat of Polymers and Their Hydrogenated
Monomers in the Same Liquid

SOV/76-32-12-7/52

crystalline or glassy glucose. The energy difference is due to the crystallization heat. This disproves other theories (Refs 1,2, and 3). There are 2 tables and 9 references, 6 of which are Soviet.

ASSOCIATION: Ural'skiy gosudarstvennyy universitet im. A. M. Gor'kogo,
Sverdlovsk (Ural State University imeni A. M. Gor'kiy,
Sverdlovsk)

SUBMITTED: July 8, 1957

Card 3/3

14V/10-120-6-37 67

AUTHOR: Eugene A. ... Tsilinskina, M. V., Suvorova, A. I.

TITLE: The Determination of the Specific Surface and the Volume of the Pores of Solid Polymeric Sorbents (Opredeleniye udel'noy poverkhnosti i ob'yema por tverdykh polimernykh sorbentov)

PERIODICAL: Doklady Akademii Nauk SSSR, 1958, Vol. 130, Nr 5, pp.570-572 (USSR)

ABSTRACT: Results hitherto obtained in this field indicate the necessity of a new form of studying the processes of the interaction between high-molecular glasses and solvents. This new process might also be suited for polymers in a vitreous state as also for solid sorbents. One of these methods, which, by the way, is being widely used, is the sorption method. However, the hitherto obtained isothermal lines of sorption do not furnish any useful data concerning the sorcity of the polymer. The causes of this lack of uniqueness are mentioned. This ambiguity can be avoided by using a liquid that is inert with respect to the given vitreous polymer. The structure of the polymer then does not change during the process of

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SOV/20-120-3-37/67

The Determination of the Specific Surface and the Volume of the Pores of
Solid Polymeric Sorbents

sorption, and the flexibility of the chain is not realized. The authors investigated the sorption of the vapors of inert liquids by polystyrene, polyvinyl alcohol, cellulose, and by triacetyl cellulose. Two sorbents of polystyrene with the molecular weights of 456000 and 133000 respectively, pulverulent triacetyl-cellulose with the molecular weight 40000, polyvinyl alcohol with the molecular weight 17000 and industrial linters were used as sorbents. As inert liquids methyl-alcohol was used for polystyrene and *n*-hexane was used for the other polymers. The apparatus used for these investigations has already been described (Ref 1). The results obtained by measurements are given in form of 2 diagrams. The isothermal lines of the sorption of methyl alcohol on polystyrene and *n*-hexane on cellulose are similar to the isothermal lines of the vapors of the same liquids on silica gel. Various details are mentioned. The course taken by the isothermal line of the sorption of the sample with the molecular weight 133000 is lower than that of the sample having the molecular weight 456000. This indicates an increasing loosening which takes place with a rising molecular weight

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100/200-120-3-37/67
The Determination of the Specific Surface and the Volume of the Pores of
Solid Polymers (Gorbunov)

of the polystyrene. A table contains the calculated values of the specific surface and the volumes of the pores for the polymers investigated. High-molecular polystyrene, cellulose, and triacetyl cellulose may be classed among the finely porous sorbents having a little-developed specific surface. With a reduction of the molecular weight of the polystyrene the specific surface and the volume of the pores diminish. The specific surface of the polyvinyl alcohol is very low. The results obtained indicate the possibility of a quantitative estimation of the porosity of polymers by investigating the inert liquids on them. There are 2 figures, 1 table and 13 references, 11 of which are Soviet.

PRESENTED: December 26, 1957, by V. A. Kargin, Member, Academy of Sciences, USSR
PERMITTED: December 25, 1957

Card 3.1

SOV/25-120-5-57/67

The Determination of the Specific Surface and the Volume of the Pores of
Solid Polymeric Sorbents

1. Polymers--Absorptive properties
2. Polymers--Adsorptive properties
3. Polymers--Porosity

Card 4 of 4

TAGER, A.A.

Effect of the molecular weight of some vitreous polymers in their
integral heats of solution. Vysokom.sped. 1 no.1:21-28 Ja '59.
(MIRA 12:9)

1. Ural'skiy gosudarstvennyy universitet im. A.M.Gor'kogo.
(Heat of solution) (Molecular weight) (Polymers)

TAGER, A.A.; BOCHKAREVA, A.P.; DVORETSKAYA, N.M.

Investigating the hardening of silicon organic resins. Part 1:
Hardening of resins prepared by the hydrolysis and condensation
of tetraethoxysilane. Vysokom.soed. 1 no.4:511-517 Ap '59.
(MIRA 12:9)

1. Ural'skiy gosudarstvennyy universitet.
(Resins, Synthetic) (Ethyl silicates)

1. AUTHOR:

T. M. A. A., Tashipotkina, M. V., Doronina, V. K.

SOV 76-33-2-16/45

2. TITLE:

The Effect of the Molecular Weight of Vitreous Polymers on the Packing Density of Their Chains (Vliyeniye molekulyarnogo vesa stekloobraznykh polimerov na plotnost' upakovki ikh tsepey). II. Polymethyl Methacrylates (II. Polimetilmetakrilaty).

3. JOURNAL:

Zhurnal fizicheskoy khimii, 1952, Vol 33, Nr 2, pp 432 - 441 (USSR)

4. ABSTRACT:

An estimate of the packing density of polymer chains can be obtained by a determination of the heat of solution (HS) and the sorption isotherms (Refs 1-3), as well as from the change in entropy (S) of the solvent (Refs 4,5). In this way the packing of polystyrene (Refs 1-4), cellulose (Ref 6), and polyvinyl alcohol (Refs 5,7) were determined. The data on the integral HS of polymethyl methacrylates (I) show (Ref 10) that an increase of the molecular weight to $M = 10000$ leads to a loosening which varies slowly but continuously with a further increase in M . For this reason three samples of (I) were chosen; sample 1 with $M = 1-3.06 \cdot 10^6$; sample 2 with

Effect of Molecular Weight of Vitreous Polymers on the Sorption of Their Solvents. II. polymethyl Methacrylates
 SOV/76-37-2-16.45

$M = 3.4 \cdot 10^5$; and sample 3 with $M = 1932$. The preparation of the samples has been described previously (Ref 10). Sorption isotherms of dichloroethane (II) and methyl isobutyrate (III) on (I) were investigated, and the (HS) of (I) in (II) (Figs 1,2) was determined; from the data obtained values for ΔH , ΔH_1 , and ΔS were calculated. It was found that (II) is more closely related to (I) than is (III). The sorption isotherms (Fig 3) of (II) on 3 samples of (I) give a picture analogous to that of polystyrene of various molecular weights. The function curves of the (HS) (Fig 4) of the solvent-composition show that with an increase in M the (HS) becomes positive. The marked decrease in the (R) of the solvent in sorption on the samples with high M cannot be explained only by the orientation of the solvent molecules on the groups of the polymer. This observation (Fig 7) is explained by a loose packing of very long, rigid chains which require a longer time for "consolidation". The looser packing thereby evidences a relaxation. With the increase in the M of the vitreous polymers the packing loosens and

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Effect of the Molecular Weight of Vitreous Polymers SOV/74-33-2-16/45
on the Sorption Density of Their Gases. II. Poly-methyl Methacrylates

thus increases the sorptivity, which occurs with an increased heat effect and a decrease in (E) . The analogy between loosely-packed, high-molecular weight glasses and solid porous colloidal sorbents is only valid during the beginning stage of the sorption. There are 7 figures and 18 references, 15 of which are Soviet.

ASSOCIATION: Ural'skiy gosudarstvennyy universitet im. Ger'kogo, Sverdlovsk
(Ural State University imeni Ger'kiy, Sverdlovsk)

DATE: July 8, 1957

June 2, 1958

5(4)

AUTHORS:

Tager, N. A., Tsilipotkina, M. V.,
Suvcova, A. I.

SOV/20-124-1-37/69

TITLE:

The Influence of Annealing on the Density of the Packing
of Polystyrene (Vliyaniye otzhiga na plotnost' upakovki polistirole)

PERIODICAL:

Doklady Akademii nauk SSSR, 1959, Vol 124, Nr 1, pp 133-134
(USSR)

ABSTRACT:

The authors investigated the influence of long annealing upon the sorption capacity of polystyrene. Annealing was carried out by slowly and gradually cooling a polystyrene sample, which had previously been heated up to $+140^{\circ}$, for about one day. The experiment was carried out with an air-thermostat fitted with a relay and a contact thermometer. Cooling from $+140^{\circ}$ to $+20^{\circ}$ lasted one month. By keeping the polystyrene at rather high temperatures (more than 100°) for a long time destruction of the samples was caused. The viscosimetrically determined molecular weight of the annealed samples decreased from 456 000 to 110 000. As, however, the density of packing in polystyrene depends largely on its molecular weight, a direct comparison between the annealed sample with the original sample would be wrong. Therefore, a sample of

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The Influence of Annealing on the Density of the
Packing of Polystyrene

SOV/20-124-1-37/69

annealed polystyrene and a fraction of not annealed polystyrene of similar molecular weight was chosen for this investigation. The authors on both samples investigated the sorption of methyl alcohol vapors, i. e. of a substance which is inert with respect to polystyrene. The isothermal lines of the sorption of methanol on the non-annealed sample has a shape which, according to A. V. Kiselev's classification, is characteristic of homogeneously fine-pored substances. The isothermal lines of sorption on an annealed sample remind of the isothermal lines of the sorption of poreless sorbents. A table contains the values of the specific surface and the volumina of pores. In the case of annealing during a very long time, the packing of molecules becomes considerably more dense, which is characterized by a reduction of pore volume and of the specific surface by 50%. This result proves the relaxation character of the looseness of the packing of high-molecular polystyrene. There are 1 figure, 1 table, and 9 references, 7 of which are Soviet.

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The Influence of Annealing on the Density of the
Packing of Polystyrene

SOV/20-124-1-37/69

ASSOCIATION: Ural'skiy gosudarstvennyy universitet im. A. M. Gor'kogo
(Ural State University imeni A. M. Gor'kiy)

PRESENTED: August 7, 1958, by V. A. Kargin, Academician

SUBMITTED: August 6, 1958

Card 3/3

TAGER, A.A.

Porosity of ion-exchange resins. Vysokom.soed. 2 no.7:994-996
J1 '60. (MIRA 13:8)

1. Ural'skiy gosudarstvennyy universitet im. A.M.Gor'kogo.
(Porosity) (Sorbents)

TAGER, A.A.; PASHKOV, A.B.; TSILIPOTKINA, M.V.; BYKOVA, N.I.

High sorptive capacity of ion-exchange resins. Vysokom.soed. 2
no.7:997-1000 J1 '60. (MIRA 13:3)

1. Ural'skiy gosudarstvennyy universitet im. A.M.Gor'kogo i
Nauchno-issledovatel'skiy institut plasticheskikh mass.
(Adsorption) (Resins, Synthetic)

S/190/61/003/012/010/012
B110/B147

AUTHORS Tager, A. A., Tsilipotkina, M. V., Romanova, D. M.
TITLE Estimation of packing density of chains of solid polymers.
III. Crystalline polymers
PERIODICAL Vysokomolekulyarnyye soyedineniya, v. 3, no. 12, 1961,
1857 - 1859

TEXT: The packing density of crystalline polymers (polyethylene (PE) and polytetrafluoroethylene (PTFE)) and of the copolymer of 15% vinyl chloride and vinylidene chlorite (saran) was examined. The sorption of inert vapors of absolute CH_3OH by PE and PTFE, and of H_2O and cryoscopically pure benzene by saran, was determined. Measurements were conducted at 25°C and 10^{-6} mm Hg. The sorption isotherms of CH_3OH on PE and PTFE are the same. In the low-pressure range (very dense packing) no sorption takes place; at $p_1/p_1^0 = 0.55$, the branch of the isotherm sharply rises (sorption
Card 1/3

S/190/61/003/012/010/012
B110/B147

Estimation of packing density ...

of amorphous ranges) and sorption becomes constant. This phenomenon neither corresponds to sorbents with ultramicropores nor to such without pores or with intermediate pores (S-shaped isotherms). It is caused by the two phase structure of PE and PTFE. The sorption isotherms of H_2O and C_2H_6 vapors on saran are similar to those of nonporous, rigid sorbents, and densely packed glass-like polymers of the polyvinyl alcohol type. As crystalline microporous sorbents, such as zeolites, they sorb smaller H_2O molecules more readily. As for active charcoal, cellulose, and polymer fibers, also for saran, p/p_0 linearly depends on $(p/p_0)/[a(1-p/p_0)]$ in the range of relative pressures of 0 - 0.5. The specific surface, S_{sp} - 23.4 m^2/g calculated therefrom proves the absence of ultramicropores in saran. The authors thank T. A. Soloboyeva for assistance with experiments. A paper by M. M. Dubinin, Ye. D. Zaverina, and L. V. Radushkevich is mentioned. There are 3 figures and 8 references: 7 Soviet and 1 non-Soviet. The reference to the English-language publication reads as

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Estimation of packing density ...

S/190/61/003/012/010/012
B110/B147

follows. I. W. Rowen, R.L. Blain, Industr. and Engng. Chem., 39 1659, 1947.

ASSOCIATION: Ural'skiy gosudarstvennyy universitet im. A. M. Gor'kogo
(Ural State University imeni A. M. Gor'kiy)

SUBMITTED: January 19, 1961

Card 3/3

TAGER, A.A.; TSILIFOTKINA, M.V.; Prinimala uchastiye: RAKOVA, G.M.

Evaluating the packing density of chains of solid polymers. Part
4: Isotactic polystyrene. Vysokom.soed. 3 no.12:1860-1862 D
'61. (MIRA 15:3)

1. Ural'skiy gosudarstvennyy universitet imeni A.M.Gor'kogo.
(Polymers) (Styrene)

DREVAL, V.YE., TAGER, A.A.

Study of the rheological properties on concentrated solutions of welastic, glassy, and crystalline polymers as a function of concentration, temperature and type of solvent.

Report presented at the 13th Conference on high-molecular compounds, Moscow, 8-11 Oct 62

SUVOROVA, A.I., TAGER, A.A.

Effect of chemical structure and dimension of plasticizer molecules
on the vitrification temperature of polymers.

Report presented at the 13th Conference on high-molecular compounds
Moscow, 8-11 Oct 62

U/190/62/004/006/002/026
B101/B110

AUTHORS: ~~Shcherbina, A. I.~~, Suvorova, A. I., Golayrev, L. N., Yesafov,
V. I., Barstova, V. L.

TITLE: Effect of the chemical structure of the plasticizer on the
vitrification temperature of polymers. I. Plasticizing of
polystyrene with diphenic acid and naphthalic acid esters

PERIODICAL: Vysokomolekulyarnyye soyedineniya, v. 4, no. 6, 1962,
803-808

TEXT: Thermomechanical curves were plotted for polystyrene (PSt)
plasticized with 25 mole% of: monomethyl-, monoethyl-, and monobutyl
diphenate; dimethyl-, diethyl-, ethyl-butyl-, dibutyl-, ethyl-octyl-, and
diheptyl diphenate; dimethyl, diethyl, and dibutyl naphthalate. The
synthesis of ethyl-butyl diphenate (b.p. 167-168°C/15 mm Hg, MR 91.89)
and of ethyl-octyl diphenate (MR 110.57), now produced for the first time,
will be published. The compatibility of the plasticizer with PSt was
studied on the basis of the critical mixing temperature, which lay at
100-130°C with diphenic acid monoester, below room temperature (sometimes
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87 90/62/004/006/002/026
B101/B110

Effect of the chemical structure ...

at -50°C) with esters of this acid, and at room temperature with naphthalates. Results: (1) The vitrification temperature, T_v , of plasticized PSt drops with increasing compatibility. Pure PSt had $T_v = 100^{\circ}\text{C}$, PSt with monoesters had $T_v = 40-70^{\circ}\text{C}$, PSt with diphenic acid diesters yielded the lowest T_v . T_v dropped with increasing length of the alkyl radical: ethyl-octyl diphenate yielded $T_v = -11^{\circ}\text{C}$; the naphthenates showed a low effect ($T_v = 9-48^{\circ}\text{C}$). (2) With increasing content of CH_2 links in the alkyl radical, T_v of diphenic acid diesters approaches a minimum at $n_{\text{CH}_2} = 10-12$, and then rises again. (3) The structure of the aromatic radical of the plasticizer affects T_v : diphenates (and phthalates) plasticize more intensively than naphthalates. There are 3 figures and 2 tables.

ASSOCIATION: Ural'skiy gosudarstvennyy universitet im. A. M. Gor'kogo
(Ural State University imeni A. M. Gor'kiy)

SUBMITTED: March 21, 1961

Card 2/2

38130

S/025/62/144/003/026/030
B124/B101

AUTHORS: Tager, A. A., Tsilipotkina, M. V., Romanova, D. M., and
Dubinin, M. M., Academician

TITLE: On microporous structure formation in the process of
thermal degradation of Saran

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 144, no. 3, 1962, 602-605

NOTE: The microporosity of active carbons obtained in the course of the thermal degradation of Saran (a copolymer of 65% vinylidene chloride and 35% vinyl chloride) was studied at temperatures between 170 and 700°C. The weight loss of Saran on heating was assumed to be equal to the weight of HCl evolved. The nitrogen adsorption isotherms of the material previously heated to various temperatures were measured at -195°C by a volumetric method and those of benzene at 24°C by a gravimetric method. The isotherms obtained for the products of thermally treated Saran are typical of molecular-sieve-type, finely porous absorbents; the limiting values of nitrogen adsorption for the sample C-700 (heated to 700°C) being 3.6 times higher than those of benzene adsorption. The structural

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On microporous structure ...

S/C20/62/144/003/026/030
B:24/B:01

constants in the adsorption equation, namely the limiting adsorption space volumes w_0 giving the micropore volumes, and the constants B which depend on the size of the micropores were determined. (Table 2). Nitrogen with $\beta = 1$ was taken as the standard substance for the calculation of B . It is experimentally found that the evolution of hydrogen chloride in the initial stages of the thermal treatment leads to the formation of larger micropores as compared to those formed at higher temperatures. There are 3 figures and 2 tables.

ASSOCIATION: Ural'skiy gosudarstvennyy universitet im. A. M. Gor'kogo
(Ural State University imeni A. M. Gor'kiy)

SUBMITTED: February 19, 1962

Table 2. Legend: (A) Sample;
(B) Nitrogen; (C) w_0^A , cm³/g;
(D) Benzene, w_0^B , cm³/g; (E) w_0^B/w_0^A .

(A) Образец	Адсор. (B)		(D) Бензол, w_0^B , cm ³ /g	(E) w_0^B/w_0^A
	w_0^A , cm ³ /g	$B \cdot 10^4$		
C	0,00	—	0,00	—
C-180	0,23	0,8	0,12	0,52
C-350	0,34	1,6	0,14	0,41
C-500	0,41	3,0	0,15	0,37
C-700	0,46	3,4	0,27	0,59

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3/190/62/004/006/003/026
B101/B110

AUTHORS: Chern, L. A., Suvorova, A. I., Goldyrev, L. N., Yesafov, V. I.,
Mogina, L. P.

TITLE: Effect of the chemical structure and the size of the plasticizer molecule on the vitrification temperature of polymers. II. Plasticizing of polymethyl methacrylate with esters of diphenic and naphthalic acids

PERIODICAL: Vysokomolekulyarnyye soyedineniya, v. 4, no. 6, 1962, 609-614

TEXT: Thermomechanical curves were plotted for polymethyl methacrylate (PMMA) plasticized with 25 mole% of: monomethyl, monobethyl, and monobutyl diphenate; dimethyl, diethyl, ethyl-butyl, dibutyl, and diheptyl diphenate; dimethyl, diethyl, and dibutyl naphthalate. Results: (1) The better the compatibility between polymer and plasticizer, the greater the drop in the vitrification temperature, T_v , of pure PMMA ($T_v = 100^\circ\text{C}$).

(2) T_v dropped with increasing length of the alkyl radicals of the diphenate down to a minimum (-9°C). (3) Monoesters of diphenic acid and naphthalates showed a lower plasticizing effect ($T_v \sim 50^\circ\text{C}$). (4) The

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Effect of the chemical structure ...

2/190/62/004/006/003/026
E101/E110

structure of the aromatic radical affects the plasticizing effect. The better plasticizing of diphenates is explained by the ability of the compound to be turned round the C-C bond between the two benzene rings. In the case of monoesters, the free COOH reduces the compatibility. (5) The molar concentration rule does not apply to the polymer plasticizer systems investigated. There are 5 figures and 1 table.

ASSOCIATION: Ural'skiy gosudarstvennyy universitet im. A. M. Gor'kogo
(Ural State University imeni A. M. Gor'kiy)

SUBMITTED: March 21, 1961

Card 2/2

TSILIPOTKINA, M.V.; TAGER, A.A.; PETROV, B.S. [deceased];
PUSTOBAYEVA, G.

Evaluation of the packing density of solid polymer chains.
Part 5: Determination of the specific surface area of polymers
by means of nitrogen vapor sorption. Vysokom. soed. 4
no.12:1844-1850 D '62. (MIRA 15:12)

1. Ural'skiy gosudarstvennyy universitet imeni A.M. Gor'kogo.
(Polymers) (Nitrogen) (Sorption)

TAGER, A.A.; TSILIPOTKINA, M.V.; ROMANOVA, D.M.; DUBININ, M.M., akademik;
Prinimala uchastiye: MAMKINA, V.V.

Formation of a microporous structure in the thermal decomposition
of saran. Dokl.AN SSSR 144 no.3:602-605 My '62. (MIRA 15:5)

1. Ural'skiy gosudarstvennyy universitet im. A.M.Gor'kogo.
(Saran) (Porosity)

TAGER, A.A.; DREVAL', V.Ye.

Viscosity and activation heats of concentrated polymer solutions as dependent on the concentration, temperature, and nature of the solvent. Dokl.AN SSSR 145 no.1:136-139 J1 '62. (MIRA 15:7)

1. Ural'skiy gosudarstvennyy universitet imeni A.M.Gor'kogo.
Predstavleno akademikom V.A.Karginym.
(Polymers) (Viscosity) (Solvents)

TAGEI, Anna Aleksandrovna. Prinimali uchastiye: TSVANKIN, D.Ya.;
BORISOVA, T.I.; BURSHEYN, L.L.; SLINKIN, A.A.; DULOV, A.A.;
MURRAYLOV, G.F., red.; ROGAYLINA, A.A., red.; SHPAK, Ye.G.,
tekhn. red.

[Physical chemistry of polymers] Fiziko-khimiia polimerov.
Moskva, Goskhimizdat, 1963. 528 p. (MIRA 16:12)
(Polymers)

S/190/63/005/001/012/020
B101/B186

AUTHORS: Tager, A. A., Podlesnyak, A. I.

TITLE: Concentrated polymer solutions. I. Determination of the integral and differential heats of solution and dilution of polyisobutylene and polystyrene

PERIODICAL: Vysokomolekulyarnyye soyedineniya, v. 5, no. 1, 1963, 87 - 93

TEXT: An improved calorimeter was designed, based on that suggested by S. M. Skuratov (Kolloidn. zh., 9, 133, 1947). It allows of measuring small heat effects during a prolonged time of reaction. The temperature was measured by thermistors and the adiabatic conditions maintained by photo relays. The sensitivity of the apparatus was 0.006 cal. The integral heat of solution, Q , was measured for polyisobutylene, molecular weight

$1.99 \cdot 10^6$, and polystyrene, molecular weight $4.13 \cdot 10^5$. The following was found for Q , cal/g polymer: polystyrene in ethyl benzene 5.76, in CCl_4 5.29; polyisobutylene in isooctane 0, in cyclohexane -0.16, in CCl_4 -0.97, in toluene -2.09. The integral heat of dilution was determined by crushing

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S/190/63/005/001/012/020
B101/B186

Concentrated polymer...

an ampoule containing a solution of known concentration in 20 ml solvent. Solutions with a concentration w_2 , of 0.1 - 0.5 parts by weight of polymer were diluted to $w_2 = 0.05$. With increasing weight fraction w_1 of solvent in the initial solution, the heat of dilution decreased, becoming zero at $w_1 = 0.7 - 0.8$ but in the system polyisobutylene - toluene was already $w_1 = 0.55$. The integral heat of solution was calculated from: $-\Delta H = (Q - q)w_2$, where Q is the integral heat of solution for 1 g polymer in a large quantity of solvent, q the integral heat of dilution for 1 g polymer, and w_2 the concentration of polymer in parts by weight. The differential heat of solution $\Delta \bar{H}_1$ and the differential heat of dilution $\Delta \bar{H}_2$ were determined from the dependence of the integral heat of solution on the composition of the solution (Fig. 6). The curves $\Delta H = f(w_2)$ and $\Delta \bar{H}_1 = f(w_2)$ for polymers have the same character as for low-molecular substances. The equation $\Delta \bar{H}_1 = [T_2 \Delta \bar{Z}_1(T_1) - T_1 \Delta \bar{Z}_1(T_2)] / (T_2 - T_1)$ used by C. E. H. Bawn, M. A. Walid

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Concentrated polymer...

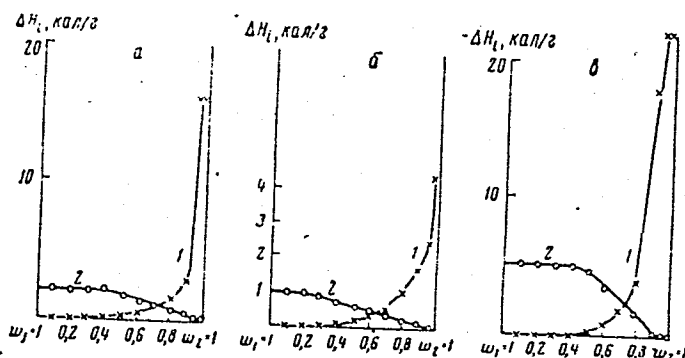
S/190/63/005/001/012/020
B101/B186

(J. Polymer Sci., 12, 109, 1954) does not allow for the temperature dependence of the heat of solution, especially between 20 - 70°C, which leads to incorrect results. There are 6 figures and 1 table.

ASSOCIATION: Ural'skiy gosudarstvennyy universitet im. A. M. Gor'kogo
(Ural State University imeni A. M. Gor'kiy)

SUBMITTED: July 19, 1961

Fig. 6. Dependence of the differential heat of solution, $\Delta\bar{H}_1$, and the differential heat of dilution, $\Delta\bar{H}_2$, on the composition of the solution. (a) polyisobutylene - toluene; (b) polyisobutylene - CCl_4 ; (c) polystyrene - CCl_4 ; (1) $\Delta\bar{H}_1$; (2) $\Delta\bar{H}_2$, cal/g.
Card 3/3



44270

S/190/63/005/001/013/020
B101/B186

AUTHORS: Tager, A. A., Tsilipotkina, M. V., Dreval', V. Ye.,
Nechayeva, O. V.

TITLE: Concentrated polymer solutions. II. Thermodynamic study of
polyisobutylene solutions in various solvents

PERIODICAL: Vysokomolekulyarnyye soyedineniya, v. 5, no. 1, 1963, 94 - 99

TEXT: The 25°C isotherms were plotted for the sorption of CCl_4 , toluene, cyclohexane, butyl propionate, and methanol vapors by polyisobutylene having the molecular weight $1.99 \cdot 10^6$. Intense adsorption was found for CCl_4 , toluene, and cyclohexane vapors, weaker adsorption for butyl propionate vapor, and no adsorption at all for methanol vapor. The properties of polymer solutions can be compared only if the concentration is given in molar parts or parts by volume, not if it is in parts by weight. The curve $\Delta\mu_1$ versus concentration in molar parts also confirmed that toluene, CCl_4 , and cyclohexane were better solvents for polyisobutylene than butyl propionate. $\Delta\mu_1$ is the difference of chemical potentials; it was calculated
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S/19C/63/005/001/013/020

B101/B186

Concentrated polymer...

from: $\Delta\mu_1 = 2.303RT \log(P/P_s)$, where P_s is the saturation pressure. The curves for the mixing entropy, $T\Delta S$, versus concentration, φ_2 , in parts by volume, were plotted for polyisobutylene dissolved in toluene, CCl_4 , cyclohexane, and isooctane. The equation found by Miller (G. Gee, Chemistry of Large Molecules) shows optimum agreement with the experimental values only in the case of the polyisobutylene - isooctane system, which is in accordance with the Flory-Huggins theory, holding for athermal systems only. In other solvents, however, a different value of $T\Delta S$ is observed for the same φ_2 , i.e., the polyisobutylene chains have varying configuration numbers. X

$T\Delta S$, ΔH , and ΔG were calculated according to Gibbs-Duhem, and the curves $T\Delta S = f(\varphi_2)$, $\Delta G = f(\varphi_2)$, $\Delta H = f(\varphi_2)$ were plotted. They show the following maxima (in cal/mole): in toluene with $\varphi_2 \sim 0.7$, $T\Delta S_{max} \sim 220$, $\Delta H_{max} \sim 115$, $\Delta G_{max} \sim -120$; in CCl_4 with $\varphi_2 \sim 0.6$, $T\Delta S_{max} \sim 130$, $\Delta H_{max} \sim 40$, $\Delta G_{max} \sim -100$; in cyclohexane with $\varphi_2 \sim 0.5$, $T\Delta S_{max} \sim 100$, $\Delta H_{max} \sim 0$, $\Delta G_{max} \sim -80$. The positive values of ΔH show that polyisobutylene is dissolved with great

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Concentrated polymer...

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B101/B186

variation of entropy. The low affinity of polyisobutylene to benzene, and the poor affinity to butyl propionate, may be due to the fact that $T\Delta S < \Delta H$, or $T\Delta S < \Delta H$. There are 5 figures. The most important English-language reference is: C. E. H. Bawn, M. A. Walid, J. Polymer Sci., 12, 109, 1954.

ASSOCIATION: Ural'skiy gosudarstvennyy universitet im. A. M. Gor'kogo
(Ural State University imeni A. M. Gor'kiy)

SUBMITTED: July 20, 1961

Card 3/3

S/190/63/005/003/021/024
B101/B203

AUTHORS: Tager, A. A., Dreval', V. Ye., Khasina, F. A.

TITLE: Concentrated polymer solutions. III. Viscosity of polyisobutylene solutions in various solvents

PERIODICAL: Vysokomolekulyarnyye soyedineniya, v. 5, no. 3, 1963, 432-439

TEXT: The viscosity of polyisobutylene solutions of molecular weight $1.2 \cdot 10^6$ in isooctane, toluene, butyl propionate, cyclohexane, decalin, and carbon tetrachloride was determined at 20-50°C in concentrations of 0-100%, and the activation heat of the viscous flow was calculated for the solutions in toluene, isooctane, carbon tetrachloride, and cyclohexane. Results: The greatest differences between the η -values in the various solvents are observed at concentrations between 0.005 and 0.1 parts by weight. At higher concentrations these differences become smaller but do not disappear. There is no relationship between the viscosity of the solution and the affinity of polyisobutylene to the solvent. The viscosity depends on the viscosity of the pure solvent and on the flexibility of the polymer chain in this solvent. The viscosity of the solution decreases with decreasing viscosity of the pure solvent and increasing flexibility of

Card 1/2

Concentrated polymer solutions...

S/190/63/005/003/021/024
B101/B203

the chain. The higher the viscosity the higher the activation heat; this does not depend directly on the energy of interaction between polymer and solvent but on the size of the segment, i.e. on the flexibility of the polymer chain. There are 4 figures and 1 table.

ASSOCIATION: Ural'skiy gosudarstvennyy universitet im. A. M. Gor'kogo
(Ural State University imeni A. M. Gor'kiy)

SUBMITTED: October 2, 1961

Card 2/2

TAGER, A.A.; DREVAL', V.Ye.; TRAYANOVA, N.G.

Effect of the molecular weight of polyisobutylene on the viscosity
and heat of activation of its concentrated solutions. Dokl. AN
SSSR 151 no.1:140-143 J1 '63. (MIRA 16:9)

1. Predstavleno akademikom V.A.Karginym.
(Polypropylene)

L 40009-65 EWT(m)/EPF(c)/EWP(v)/EPR/EWP(j)/T Pc-4/Pr-4/Ps-4 RM/WW/GS

ACCESSION NR: AT4049839

S/0000/64/000/000/0023/0027

AUTHOR: Kuleznev, V. N.; Tager, A. A.; Letunova, T. I.

TITLE: Investigation of the effect of oxidation-reduction systems on polymers in solution

SOURCE: Khimicheskiye svoystva i modifikatsiya polimerov (Chemical properties and the modification of polymers); sbornik statey. Moscow, Izd-vo Nauka, 1964, 23-27

TOPIC TAGS: oxidation reduction system, polychloroprene rubber, butadiene rubber, polymer solution, rubber crosslinking, vulcanization, polymer viscosity

ABSTRACT: The authors investigated the effect of reversible and irreversible oxidation-reduction systems on the crosslinking of polychloroprene (PKhP) and butadiene (SKB) rubber in solution at room temperature and with a limited access of oxygen. The experimental procedure is described in detail. The change in viscosity of an SKB solution during vulcanization is plotted. The time of crosslinking is plotted against the concentration of benzoyl peroxide, benzoin and iron stearate. For both rubbers, crosslinking time decreases with increasing concentration of the components. Crosslinking time is longer for PKhP than for SKB in all cases; in dichloroethane, PKhP is crosslinked much more slowly than in

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1A2

L 40009-65

ACCESSION NR: AT4049839

2

benzene. The time of crosslinking is affected to a certain extent by the nature of the iron salt residue; iron stearate is more active than the oleate. Crosslinking of PKhP under the influence of reversible redox systems shows that not only 1,2-bonds participate in the chemical reactions but also 1,4-bonds. Iron stearate has an inhibitory effect on PKhP at a concentration of 40 mol.% stearate, and for SKB at 15 mol.%. It was found that irreversible systems do not have a crosslinking effect under these conditions. Introduction of the irreversible redox system benzoyl peroxide-iron stearate-benzoin causes the viscosity of the solution and gel formation to increase considerably. In the case of a limited access of oxygen, only the reversible redox systems have an effective crosslinking effect. Tabulated data on the effect of previous processing on crosslinking show that the time of crosslinking for SKB previously rolled is longer than for unrolled rubber. Gels from solutions of extracted SKB have a less dense structure than gels from ordinary SKB. It is concluded on the basis of an experiment on the adhesion of Nairit resin that the adhesive compositions containing reversible redox systems can be used in practice for bonding rubbers in the cold. Orig. art. has: 4 figures and 2 tables.

ASSOCIATION: Ural'skiy gosudarstvennyy universitet im. A.M. Gor'kogo (Ural state university)

Card 2/3

Submitted: 12 MAY 62

TAGER, A.A.; DROVNI, V.Ye.; KHANANOVA, A.A.

Viscosity of critical mixtures polymer - low molecular liquid. Vysokom.
sred. 4 no.9:1593-1599 S '61. (MIRA 17:10)

1. Ural'skiy gosudarstvennyy universitet imeni Gori'kova.

L 61726-65 EWT(m)/EPF(c)/EWP(j)/EWA(c) Pc-4/Pr-4/Ps-4 RPL WW/RM

ACCESSION NR: AP5013062

UR/0190/65/007/005/0891/0897
678.01:53+678.664

AUTHORS: Karas', L. Ya.; Tager, A. A.

TITLE: The mechanical properties of three-dimensional polyurethanes prepared on the basis of polydiethylene-succinate, polydiethyleneadipate, and polydiethylene-sebacate. 1st communication in the series "Influence of the chemical nature of the chain and degree of cross-linkage on the properties of polyurethanes"

SOURCE: Vysokomolekulyarnyye soyedineniya, v. 7, no. 5, 1965, 891-897

TOPIC TAGS: polymer, resin, polyurethane plastic, tensile stress, tensile strength, polyethylene

ABSTRACT: Physical properties of polyurethanes were determined in order to clarify existing discrepancies in the literature regarding the effect of cross-linkage network density on the mechanical and other properties of three-dimensional polyurethanes of different chemical natures. The mechanical properties of polyurethanes prepared on the basis of polyethylene-succinate, polyethylene-adipate and polyethylene-sebacate in the presence of trimethylpropane were studied. The degree of cross-linkage was determined by adjusting the concentration of

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L 61726-65

ACCESSION NR: AP5013062

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trimethylpropane. The reactions were carried out at 120C. It was found that the mechanical properties of the polyurethane depend on the chemical nature of the polyurethane and the degree of cross-linkage. Increase in the degree of cross-linkage causes a drastic decrease in the strength of the polymer but has little effect on the glass temperature. The tensile strength of polyurethanes when expressed on a function of the degree of cross-linkage has a maximum, the nature and magnitude of which is determined by the ease of crystallization of the polyurethane. Aging increases the tensile strength of polyethylene-sebacate. It is concluded that, since the curves of tensile strength versus degree of cross-linkage intersect for different polyurethanes, the mechanical properties of the latter must be investigated over wide regions of cross-linkage before their suitability for a particular industrial application can be assessed. Zh. D. Timoshenko and R. S. Shcheglova participated in the experimental part of the investigation. Orig. art. has: 2 tables and 6 graphs.

ASSOCIATION: Ural'skiy gosudarstvennyy universitet im. Gor'kogo (Ural State University)

SUBMITTED: 21Jul64

ENCL: 00

SUB CODE: MT, CC

NO REF SOV: 003

OTHER: 009

aum
Card 2/2

L 18572-66 EWT(m)/ENP(j)/T/ETC(m)-6 WW/JW/JWD/RM
 ACC NR: AP6002432 SOURCE CODE: UR/0020/65/165/005/1122/1125
 AUTHORS: Tager, A. A.; Karas', L. Ya. 67
 ORG: none 7.44.55
 TITLE: Thermodynamics of swelling of three-dimensional polyurethanes 11~
 SOURCE: AN SSSR. Doklady, v. 165, no. 5, 1965, 1122-1125
 TOPIC TAGS: polymer, polyurethane, thermodynamic analysis, thermodynamic function, thermodynamic property
 ABSTRACT: The sorbtion isotherms for the sorbtion of dioxane on a number of polyurethanes and also the entropy and enthalpy of mixing polyurethanes in dioxane solutions were determined. The sorbtion experiments were carried out by the method of A. A. Tager and V. A. Kargin (Koll. zhurn., 10, 455, 1948) and the solution experiments by the method of A. A. Tager (Fiziko-khimiya polimerov, M., 1963. str. 380). The experimental results are presented in graphs and tables (see Fig. 1). It is concluded that the flexibility of the polyurethane chains increases with increase in the number of methyl groups between the complex ester linkages. This paper was presented by Academician V. A. Kargin on 15 May 1965.
 Cord 1/2 UDC: 678.03:53+678.664 2

L 18572-66

ACC NR: AP6002432

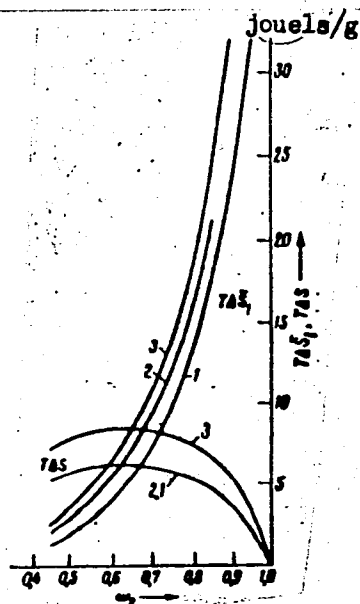


Fig. 1. Dependence of the entropy of mixing on the composition of the solution.
1 - polyurethane succinate,
2 - polyurethane adipate
(B-1), 3 - polyurethane
sebacinate.

Orig. art. has: 1 table and 3 graphs.

SUB CODE: 11. 07/SUBM DATE: 15 May 65/
Card 2/2 SHV

ORIG REF: 009/

OTH REF: 001

TAGER, A.A.; MYKHAILOV, S.V.; POLONSKAYA, V.V.; FEDOROVA, L.M.; DUL'DISEVA, L.D.

Representative of investment casting. Lit. proizv. no.9:36-39 S '64.
(MIRA 18:10)

CHULANOV, V.N.; STESHENKO, Ye.M.; TAGER, A.R.

Operation of the cement works of an aluminum factory. TSement 27
no. 2:8-10 Mr-Ap '61. (MIRA 14:5)

(Dust—Removal) (Cement plants)

VIROTCHENKO, I.I.; KOKAR', I.N.; TAGER, A.R.

Soundproofing a mill. TSement 28 no.3:19-20 My-Je '62.
(MIRA 15:7)

1. Volkhovskiy alyuminiyevyy zavod.
(Milling machinery--Soundproofing)
(Cement plants--Equipment and supplies)

9.1300
9.2585

87222
5/22/86/11/11/11/11
AD1/AD1

Translation from: Referativnyy zhurnal, Fizika, 1960, No. 11, p. 504, # 30750

AUTHORS: Solntsev, V.A., Tager, A.S.

TITLE: Electronic Waves in a Periodic Electrostatic Field and Their Interaction With the Field of Waveguide Systems

PERIODICAL: Tr. Konferentsii po elektronike SVCh, 1957, Moscow-Leningrad, Gosenergoizdat, 1959, pp. 112-132

TEXT: The propagation of a weak high-frequency signal in a rectilinear electronic flux with the velocity of electrons varying periodically along the beam was theoretically studied. Space harmonics of the current are considered, conditions of increasing their amplitudes are obtained at the motion of the beam in free space. The interaction of current harmonics with the electromagnetic field of the waveguide system was studied by the methods of the weak signal theory. The analysis was performed with allowance for the reverse effect of a HF field on the electronic beam. It is shown that an effective interaction of the electronic beam with the fast waves of the waveguide system can be brought about at certain relations between the velocity of electrons and the period of its variation. The

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S. 158.60/000/011/00-017
A001/4001.

Electronic Waves in a Periodic Electrostatic Field and Their Interaction With the Field of Waveguide Systems

effectiveness of such a device (electrostatic undulator) was compared, within the framework of the linear theory, with the effectiveness of the instrument of ЛВВ (LBV) or ЛОВ (LOV) type; it is shown that the non-relativistic undulator does not yield a gain in maximum frequency. Conditions are specified under which an employment of periodic electrostatic focusing in LBV does not result in deterioration of their characteristics.

A.S. Payer

Translator's note This is the full translation of the original Russian abstract.

Card 2/2

AUTHOR TAGER, A.S. PA - 2578
 TITLE Research on noise property of travelling wave valves.
 (Issledovaniye shumovyykh svoystv lamp s befushchey volnoy.Russian)
 PERIODICAL Radiotekhnika i Elektronika, 1957, Vol2, Nr 2, pp 222-229
 (U.S.S.R.)
 Received 4/1957 Reviewed 6/1957
 ABSTRACT The lecture was delivered in 1956 at the International High
 Frequency-Electronic Congress in Paris. It is shown that, with
 the primary fluctuations resulting from excitation of the waves
 of the space charge of higher type which are not in correlation
 with the ground wave being taken into account, the minimum coef-
 ficient of the noise of travelling wave valves in the case of
 oversaturation of the cathode, considerably exceeds 6 db. This is
 carried out by a method which is analogous to that of J.Pierce
 (Proc. IRE, 1952, 40, 12, 1675-1680). The difference consists
 in the fact that here a three-dimensional problem is dealt with,
 that the charge of the electron is assumed to be punctiform, and
 the excitation in the bundle of waves of a higher type of space
 charge is taken into consideration. The characteristics of the
 noise of travelling wave valves were investigated experimental-
 ly on valves with a movable electron gun. The relations are gi-
 ven between the coefficient of noise of travelling wave valves and
 the distance between the electron gun and the beginning of the
 spiral of deceleration as well as between this coefficient and

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Research on noise property of travelling wave valves. PA -2578

the velocity of the electrons in this space, the bundle-current, the potential relation of gun electrodes, the focussing magnetic field, and the mode of operation of the cathode. Experimental data are compared with theoretical data and the correctness of the claim that the space charge near the cathode plays an important part in the case of the depression of vortex noise at superhigh frequencies, is confirmed.

(7 ill. and 1 citation from a Slav Publication).

ASSOCIATION

PRESENTED BY

SUBMITTED

8/1956

AVAILABLE

Library of Congress

Card 2/2

1000, 1000

RECEIVED: December 7, 1957

AUTHORS: Golubov, P.Y. and Tsirring, Sh. Ye.

TITLE: The Second All-Union Conference on Radioelectronics of the Ministry of Higher Education of the USSR (Vtoraya vsesoyuznaya konferentsiya MVO SSSR po radioelektronike) - News Item

PERIODICAL: Radiotekhnika i Elektronika, 1958, Vol 3, No 3,

pp 440 - 444 (USSR)

ABSTRACT: The conference took place during September 23 - 29, 1957, at Saratovskiy gosudarstvennyy universitet imeni N.G. Chernyshevskogo (Saratov State University named after N.G. Chernyshevsky). Apart from the university itself, the conference was attended by the representatives of the scientific research institutes of the Soviet Union, the Ukrainian Academy of Sciences, various industrial establishments, the interested ministries. The plans for the future research and evaluation of universities in the field of radioelectronics. Comparison of the Efficiency of Certain Methods of Generation of Millimeter Waves by A.S. Tager and Application of the Higher Spatial Harmonics of the Magnetic Field in Slowing-down Systems by A.S. Tager and V.A. Spitsnagel.

A number of the papers in the Electrodynamics Section dealt with the complex phenomena appearing at the junctions of waveguides. Here, it is necessary to mention the papers: "The Calculation of Junctions" by Ya.M. Luchynskiy.

24(3)

AUTHORS:

Tager, A. S., Gladun, A. D.

SOV/56-35-3-49/61

TITLE:

On the Use of Cyclotron Resonance in Semiconductors for the Amplification and Production of Superhigh-Frequency Oscillations (Ob izpol'zovanii tsiklotronnogo rezonansa v poluprovodnikakh dlya usileniya i generirovaniya sverkhvysokochastotnykh kolebaniy)

PERIODICAL:

Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol 35, Nr 3, pp 808 - 809 (USSR)

ABSTRACT:

In the cyclotron resonance in some semiconductors (as e.g. in Ge, Si) it was found that, in addition to the base lines of absorption, lines occur on such frequencies as are multiples of the cyclotron fundamental frequency. This effect is connected with the non-harmonic character of the motion of the holes. This phenomenon is suited for the production of regenerative amplifiers of generators of superhigh frequencies. In this connection, the following scheme is, for example, possible: The high-frequency electric "pumping field" (pole nakachka) E_H with the frequency $\omega_H = n\omega_{\text{cyclotron}} = neH_0/m^*c$ ($n = 1, 2, 3, \dots$) acts

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On the Use of Cyclotron Resonance in Semiconductors
for the Amplification and Production of Superhigh-
Frequency Oscillations

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upon a semiconductor located in a constant magnetic field H_0 . Here m^* denotes the effective mass of an electron (m_e^*) or hole (m_h^*). The aforementioned electric field acts in the plane which is vertical to H_0 . If the field E_H is sufficiently strong, oscillations can be excited in the system on the frequencies $\omega_c = l\omega_H/n = l\omega_{\text{cyclotron}}$, $l = 1, 2, \dots$. These frequencies may be higher or lower than the "pumping frequency". The excitation of such oscillations is facilitated by such a position of the semiconductor in the resonator for which ω_H and ω_c are eigenfrequencies. An important advantage offered by cyclotron-resonance when compared to paramagnetic resonance is the possibility of making use of shortwave bands of superhigh frequencies (millimeters and submillimeters). Finally, a method of amplifying or transforming the frequency of oscillations is given for the case in which the non-harmonic character of cyclotron oscillations of the carriers is only weak or

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On the Use of Cyclotron Resonance in Semiconductors
for the Amplification and Production of Superhigh-
Frequency Oscillations

SOV/56-35-3-49/61

non-existent. There are 5 references, 1 of which is Soviet.

SUBMITTED: June 17, 1958

Card 3/3

6474

SOV/141-1-5-6-18/28

AUTHORS: Solntsev, V.A. and Tager, A.S.

TITLE: Theory of the Interaction of Two Electron Beams Moving in a Periodic Electrostatic Field

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1958, Vol 1, Nr 5-6, pp 127 - 158 (USSR)

ABSTRACT: The problem discussed was partly investigated by the authors in two earlier works (Refs 1 and 2). The analysis given is carried out under the following assumptions: 1) the electron trajectories are rectilinear; 2) the constant component of the electron space charge is compensated by ions; 3) the excitation of the higher-order space charge waves in the beam is neglected and, 4) both beams are of the single-velocity type. The two electron beams are fully intermixed and move along the axis z with velocities $v^{(1)}(z)$ and $v^{(2)}(z)$; the velocities change with a period L . This change of velocities can be secured by employing a periodic electrostatic field. The equations of the high frequency components of the current

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SOV/141-1-5-6-18/28

Theory of the Interaction of Two Electron Beams Moving in a Periodic Electrostatic Field

densities $i^{(1)}$ and $i^{(2)}$ in the two beams are described by (see Refs 1 and 2):

$$\begin{aligned} & \frac{d^2 i^{(1,2)}}{dz^2} + 2j \frac{\omega}{v^{(1,2)}} \frac{di^{(1,2)}}{dz} - \frac{\omega^2}{(v^{(1,2)})^2} i^{(1,2)} + \\ & + \frac{1}{v^{(1,2)}} \frac{dv^{(1,2)}}{dz} \left(2j \frac{\omega}{v^{(1,2)}} i^{(1,2)} + 3 \frac{di^{(1,2)}}{dz} \right) = \frac{j\omega J^{(1,2)}}{(v^{(1,2)})^3} E(z) \end{aligned} \quad (4)$$

where $E(z)$ is the longitudinal component of the high-frequency field, J is the constant component of the current density and $\eta = e/m$. The solution of Eq (4) is in the form of Eq (6), where γ denotes the propagation constant for the zero space harmonic of the current. By introducing new variables, defined by Eq (7), Eq (4) can be

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SOV/141-1-5-6-18/28

Theory of the Interaction of Two Electron Beams **Moving** in a Periodic Electrostatic Field

written as Eq (8). The integration of this leads to Eq (9). The solution of this is in the form of Eq (10). On the other hand, Eq (6) may be written as Eq (11). Now, Eq (9) can be solved in terms of the series defined by Eqs (12) and (15) where b_k and a_k are given by Eqs (13a) and (13b). By substituting the series of Eqs (11) and (15) into Eq (9) and carrying out the integration, an infinite system of linear algebraic equations is obtained. These relate the amplitudes $c_n^{(1)}$ and $c_n^{(2)}$ and are given by Eqs (15). If the system is to give significant solutions, its determinant should be equal to zero, as defined by Eq (16). This represents a general equation of the dispersion of two intermixed electron beams. If the space charge is comparatively small, the system obeys Eqs (18) and (19). The dispersion equation is, therefore, given by Eq (20). If the average plasma frequencies of the waves in the beams are equal, Eq (20) is represented by Eq (22); the solution of this is in the form of Eq (23). The solution

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00474

SOV/141-1-5-6-18/28

Theory of the Interaction of Two Electron Beams Moving in a Periodic Electrostatic Field

is plotted in Figure 2 for various values of a_k . The relative width of the interaction bands is given by Eq (24a). On the other hand, the maximum amplification in db per unit length of the beam is expressed by Eq (26a). Eqs (24) and (26) show that the efficiency of the interaction of the electron beams depends on the coefficients a_k . It is shown in the appendix to the paper that the coefficient a_k for a system with sinusoidally varying electrostatic potential is given by Eq (28), where φ_S is defined by Eq (29). On the other hand, for an electrostatic system with a stepwise change of the potential (Figure 4), a_k is given by Eq (30), where φ_c is defined by Eq (31). The dependence of a_k on φ_c is illustrated in Figure 5. Normally, the spread of the electron velocities (which was not taken into account in the above analysis) has a considerable influence on the

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SOV/141-1 5-6-18/28

Theory of the Interaction of Two Electron Beams Moving in a Periodic Electrostatic Field

characteristics of a two-beam tube. This effect can be evaluated approximately (M.I. Rodak - Ref 6). The electron velocity distribution function is given by Eq (32), where N denotes the density of the electrons, while v_T is a parameter characterising the spread of the electron velocities. The dispersion equation for v_T can be written as Eq (33). On the basis of the above analysis, it is concluded that the introduction of a periodic change in the velocity of the electrons in a two-beam tube leads to the appearance of the higher-order interaction regions; these regions lie in the vicinity of the frequencies which are practically independent of the magnitude of the space charge of the beam. There are 5 figures and 7 references, of which 5 are English and 4 Soviet.

SUBMITTED: May 12, 1958

Card 5/5

TAHER, A. S. (Moscow) and FAYN, V. M.

"Spontaneous Radiation of a Particle System, Whose Dimensions Are Comparable to the Wave Length".

report presented at the All-Union Conference on Statistical Radio Physics, Gor'kiy, 13-18 October 1958. (Izv. vyssh uchev zaved-Radiotekh., vol. 3, No. 1, pp 121-127) COMPLETE card under SIFOROV, V. I.)

TAGER, A.S.; GLADUN, A.D.

Use of cyclotron resonance in semiconductors for the amplification
and generation of superhigh-frequency oscillations. Zhur. eksp. i
teor. fiz. 35 no. 3:808-809 S '58. (MIRA 12:3)
(Semiconductors) (Oscillations)

М. Б. Голант.
А. С. Тарг.
О исследовании работы параметрических усилителей СВЧ, в которых используется метод комбинации частот

В. О. Сахаров.
О предельных параметрах мощных микроволновых преобразователей

9 июня
(с 18 до 22 часов)

А. Д. Васильев.
О методе граничной частоты в теории микроволновых пучков

Г. А. Зубов.
О взаимодействии микроволнового потока с микроволновыми пучками

М. Б. Голант.
Метод расчета параметров микроволнового СВЧ генератора на нелинейном элементе

Л. Н. Демидов,
Ю. Н. Печенкин

О предельных коэффициентах управления ЛД по степеням распространения в нелинейной системе при наличии микроволнового пучка

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А. В. Голант.
Взаимодействие микроволнового потока с микроволновыми микроволновыми пучками

10 июня
(с 10 до 16 часов)

А. М. Терещенко,
В. А. Коробков.
О взаимодействии излучения параметрических резонаторов и системы микроволнового излучения с микроволновыми пучками

М. М. Кузнецов,
Л. В. Рязанский.
К вопросу о взаимодействии флюктуаций в микроволновом

М. М. Кузнецов,
М. М. Бердасов,
В. Е. Нечко

Экспериментальные исследования флюктуаций в микроволновом

М. М. Кузнецов,
В. Е. Нечко,
В. Е. Нечко

Математический анализ для решения уравнений движения микроволновых пучков в микроволновом магнетронном пучке

33

report submitted for the Centennial Meeting of the Scientific Technological Society of
Radio Engineering and Electrical Communications in. A. S. Popov (VSEKIE), Moscow,
8-12 June. 1959

М. А. Мещеряков
Ученый секретарь научного общества
инженеров-электриков

10 июня
(с 18 до 22 часов)

Д. И. Вострицкий,
Р. А. Границкий
Защитная система в виде спиральной катушки
из ЛСВ

С. Г. Константинов
(Полупроводниковая система с безымянной антенной)

И. М. Бабенко,
И. М. Галицкий,
И. М. Калашников,
И. М. Мещеряков
Исследование измерений волн и пространств
взаимодействия приборов СВЧ с помощью антенны
для измерения пространственной части

Г. А. Мещеряков,
Е. Д. Мещеряков
Защитная система типа фильтра для защиты антенн
с безымянной антенной

24

11 июня
(с 10 до 16 часов)

Совместное заседание с темой: Физические
устройства СВЧ

В. И. Зубов, М. С. Мещеряков
Некоторые вопросы теории параметрических усилителей

В. П. Тютчевский
К теории ферритового усилителя

В. П. Тютчевский,
Ю. Т. Дуров,
В. В. Кореньков
Экспериментальное исследование ферритового усилителя

А. Л. Мещеряков,
И. З. Мещеряков
Некоторые результаты исследования ферритовых усилителей

А. С. Тютчевский
К теории параметрических усилителей в волноводных системах

25

report submitted for the Centennial Meeting of the Scientific Technological Society of
Radio Engineering and Electrical Communications in A. S. Popov (VSEIE), Moscow,
8-12 June, 1959

М. Л. Штеин,
Л. М. Штеин
О спектре электромагнитного излучения ферритовых
структур

14 СЕССИЯ ФЕРРИТОВЫХ УСТРОЙСТВ СВЧ
Руководитель А. Л. Мухомов

11 июня
(с 10 до 18 часов)

Совместное заседание с секцией радиотехники
В. М. Зубов,
М. С. Мясоев

Некоторые вопросы теории параметрических устройств

В. П. Тихоновский
К теории ферритового усилителя

В. П. Тихоновский,
Ю. Г. Доронин,
В. В. Коростов

Экспериментальное исследование ферритового усилителя

64

А. Л. Мухомов,
М. З. Шахри
Некоторые результаты исследования ферритовых
усилителей

А. С. Татар
К теории параметрического усилителя с взаимными
связями

11 июня
(с 18 до 22 часов)

А. А. Постышевский,
Сиб-Вин-Шен
Косинусовый эффект в ферритовой сфере в поле
высокой частоты

А. Л. Мухомов,
В. В. Антонов

Синтез параметрических устройств в ферритах

А. Л. Мухомов,
А. В. Смирнов

О ферритовых микшерах предельно типа

А. Л. Мухомов,
М. Г. Тейтельбаум

Применение ферритов для управления частотой
магнетронных микроволн

65

report submitted for the Centennial Meeting of the Scientific Technological Society of
Radio Engineering and Electrical Communications in A. S. Popov (VSEI), Moscow,
8-12 June, 1959

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PHASE I BOOK EXPLOITATION

Konferentsiya po elektronike sverkhvysokoy chastoty

Trudy (Transactions of the Conference on Superhigh-Frequency Electronics) Moscow, Gosenergoizdat, 1959. 271 p. 3,500 copies printed.

Sponsoring Agency: Vsesoyuznyy nauchnyy sovet po radiofizike i radio-tekhnike AN SSSR.

Eds. (Title page): I. S. Dzhigit, Professor, and Ye. G. Solov'yev, Candidate of Technical Sciences; Ed.: S. Akalunin; Tech. Ed.: G. Ye. Lariouov.

PURPOSE: This book is intended for scientific and technical personnel concerned with the development and operation of superhigh-frequency devices.

COVERAGE: The book contains a number of papers dealing with the more important problems of superhigh-frequency electronics. The papers were submitted at the Conference on Electronics called by the Vsesoyuznyy nauchnyy sovet po radiofizike i radioelekhnike AN SSSR (All-Union Scientific Council for Radiophysics and Radio Engineering, AS USSR) and the Byuro novoy tekhniki MO SSSR (Bureau of Modern Engineering, Ministry of Defense, USSR) and held in Moscow in 1957. The reports deal with the following topics: problems of the theory and calculation of the delay systems of traveling-wave and backward-wave tubes; certain phenomena occurring in a cylindrical electron beam finding itself in a uniform magnetic field; the focusing of long beams by means of periodic magnetic and electric fields; and some problems concerning reflex klystrons. Modern types of cathodes for superhigh-frequency devices are described. No personalities are mentioned. References accompany most of the reports.

Aronskaya, M. N., V. G. Gabyashev, A. S. Dunayev, S. A. Ziminovskiy, N. A. Lyubimov, A. G. Mikhlin, and G. P. Shchepkinov. Klystron "Amplifier of the 10-Centimeter Band with 20-Milliwatt Pulse Power	58
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AUTHORS Solntsev, V.A. and Tager, A.S.
 TITLE: Periodic Interaction of Electron Streams
 PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1959, Vol 2, Nr 1, pp 101 - 110 (USSR)
 ABSTRACT: It is shown that where interaction takes place, non-evanescent processes occur not only in the fundamental band but also in narrow, higher-frequency intervals. The effect is independent of current density but is limited by dispersion in electron velocity. Previous analyses have most often been concerned with two electron streams having different, constant velocities. The forms of interaction studied here are shown in Figure 1. In the first three variants, parameters of the electron stream change periodically; in Figure 1a, velocity; Figure 1b, stream diameter; Figure 1B, drift-tube diameter. In the structures of Figure 1v the interaction is modified by slots in a screen and in Figure 1Δ by a "slalom" focusing arrangement. With continuous interaction the maximum working frequency depends on plasma frequency and velocity dispersion as discussed in Ref 1 (V.M. Lopukhin). The reason for the existence of discrete

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bands of frequency in the interaction with a periodic structure is best seen in the case of Figure 1r. If the streams only interact over the length of a slot then the phase change of the faster space-charge wave between one slot and the next must equal that of the slower wave or differ from it by $2\pi k$, where k is a whole number. The simple formula quoted in Ref 1 then becomes Eq (3). An alternative viewpoint is that the higher order bands arise from synchronism between, e.g. the m -th spatial harmonic of the slower beam with the n -th of the faster one. If the relation between current density and stream cross-section is Eq (8) and replacing the high-frequency component of velocity, current density and space charge by equivalent quantities in Eq (11), the relation between equivalent current density and longitudinal electric field is Eq (15). The longitudinal electric fields induced in one stream by current in another are Eq (16). If thin streams are considered, the expression (A.6) derived in the appendix allows for the reduction in the axial component of Coulomb force in comparison with the

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Periodic Interaction of Electron Streams

case of a stream of infinite section. Using this 'depression coefficient' (A.6), the equivalent current densities are Eq (21) and the propagation constant is to be found from Eq (28). A simplified form of this latter expression is Eq (29) in terms of R_k , the interaction

coefficient. The condition for amplification to occur is Eq (32). Values for R_k are derived for particular

cases: thin streams comparatively far apart, Eq (34); tubular streams - the expression to be found in the work of J.R. Pierce (Ref 6); plane streams separated by a periodic screen, Eq (36); the arrangement of Figure 1B, Eq (37).

There are 1 figure and 7 references, of which 4 are Soviet and 3 English.

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AUTHORS: Solntsev, V.A., and Tager, A.S.
TITLE: Excitation of Waveguide Systems by an Electron Stream with Prescribed Modulation ^{2/}

PERIODICAL: Radiotekhnika i elektronika, Vol 5, No 7, 1960,
pp 1100-1111 (USSR)

ABSTRACT: In the majority of published work on the theory of waveguide excitation by prescribed currents, monochromatic currents with prescribed space distribution are considered. The most general theory of monochromatic current excitation of waveguides is given by Vaynshteyn (Refs 1, 2). On the other hand, in the theory of the Cherenkov and Doppler effects in waveguide systems, the radiation of a point charge or an elementary electric dipole moving rectilinearly along the waveguide is considered. The spectral density of the current connected with such a charge or dipole is constant over a very wide band of frequencies. In real electron devices the current spectrum has a complex character and does not reduce to either of the cases considered. The basic formulae obtained by the two methods differ from each other in principle. The present work

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